

User's Manual

Auto Ref/Keratometer GRK-6000



Usage precautions

Before use

- CAUTION**
- **Do not use the device for other than the intended purpose.**
We are not responsible for accidents or malfunctions caused by careless use.
 - **Be sure to read the manual prior to operation of the device to understand the safety precautions and operating procedures thoroughly.**
Using the device for purposes other than specified in this manual may cause unexpected malfunctions and/or adverse events.
 - **Never disassemble nor touch the inside of the device.**
This may result in electric shock or malfunction.
 - **Install the device in an environment that meets the following conditions. The following conditions must be maintained during use.**
Use conditions
Temperature: 10 to 35°C (50 to 95°F)
Humidity: 30 to 90% (Non-condensing)
Pressure: 800 to 1060 hPa
A place with low dust
A place with little external light
A level and stable surface free from vibration and shock
If the device is not installed and used under the above conditions, the reliability of measured results is impaired, and malfunction may result. In addition, there is a possibility of injury if the device receives shock and falls down.
 - **Avoid storing the device where it is exposed to rain or water, or poisonous gas or liquid is present.**
Corrosion or malfunction of the device may occur.
 - **Avoid installing the device where it is exposed to direct air-conditioning flow.**
Changes in temperature may result in condensation inside the device or adversely affect measurements.
 - **Be sure to use a (HOSPITAL GRADE) wall outlet which meets the power specification requirements.**
If the line voltage is too high or too low, the device may not perform properly. Malfunction or fire may occur.
 - **Connect the power plug to a ground outlet. Or connect a grounding wire to a ground terminal.**
Electric shock or fire may occur in the event of device malfunction or power leakage.
 - **Never use a power strip or extension cable to supply the device with power.**
The electrical safety may be lowered.
-

CAUTION

- **Do not use a power cord other than the one provided. Also do not connect the provided power cord to any other device.**

Failure or fire may result.

- **Do not place heavy objects on the power cord.**

The damaged power cord may cause fire or electric shock.

- **Before connecting the cable, turn off the power switch and disconnect the power cord from the outlet.**

Malfunction of the device may result.

- **When the device is carried, two persons should hold it at the front and the back (both right and left sides). Avoid lifting by the forehead rest or main body instead hold it by the bottom of the base.**

If only one person carries the device, or areas other than the base are used for lifting and the device falls, there is a possibility of injury or malfunction.

- **To transport the device, use the special packing materials to protect the device from impact of dropping.**

Excessive vibration or impact to the device may cause malfunction.

- **During installation and operation of the device, observe the following instructions about EMC (electromagnetic compatibility):**

Do not use the device simultaneously with other electronic equipment to avoid electromagnetic interference with the operation of the device.

Do not use the device near, on, or under other electronic equipment to avoid electromagnetic interference with the operation of the device.

Do not use the device in the same room with other equipment such as life-support equipment, other equipment that has major affects on the life of the patient and results of treatment, or other measurement or treatment equipment that involves small electric current.

Do not use the device simultaneously with portable and mobile radio frequency communication systems because it may have an adverse effect on operation of the device.

Do not use cables and accessories that are not specified for the device because that may increase the emission of electromagnetic waves from the device or the system and decrease the immunity of the device to electromagnetic disturbance.

- **The Electromagnetic Compatibility Directive sets the essential requirements for electrical and electronic equipment that may disturb, or be disturbed by**
-

During use

- CAUTION** other equipment. Follow the guidance in the tables for use of the device in an electromagnetic environment.
- **Before use, perform visual and operation checks. If abnormal conditions are encountered, stop using the device.**
If the device is used under abnormal conditions, intended results may not occur. Also unexpected malfunctions or health hazards may occur due to improper measurement.
 - **Before treating each patient, clean the patient's contact area (chin rest and forehead rest) with clean absorbent cotton or gauze dampened with rubbing alcohol.**
If chinrest paper is used, remove one piece for each patient.
For severe stains, wipe the area not with a dry cloth but with gauze dampened with alcohol.
 - **Keep the measuring window free of fingerprints and dust.**
The measurement accuracy may decrease substantially.
 - **In the event of smoke or strange odors, immediately turn off the device and disconnect the power plug from the outlet. After you are sure that the smoke has stopped, then contact us or your authorized distributor.**
Usage of the device under such abnormal conditions may cause fire or electric shock. In case of fire, use a dry chemical (ABC) extinguisher to extinguish the fire.
 - **Immediately replace the power cord if the internal wires are exposed, the device turns on or off when the power cord is moved, or the cord and/or plug are too hot to be held with hands.**
This may result in electric shock or fire.
In the event of malfunction, disconnect the power cord from the wall outlet. Never touch the inside of the device.
 - **Never press on the LCD with a hard object such as a ball-point pen. Keep magnetic objects away from the LCD.**
The device may be damaged.
 - **Do not operate the LCD with wet hands.**
Water seeping into the device may result in failure of the device.
 - **There may be a few dead or constantly-lit pixels in your LCD. This does not represent failure of the LCD; This is due to the structure of the LCD.**
-

CAUTION

- This device has been tested and found to comply with the limits for medical devices to the IEC 60601-1-2: 2001/am1: 2004, and Medical Device Directive 93/42/EEC.

These limits are designed to provide reasonable protection against harmful interference in a standard medical installation.

This device generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to other devices in the vicinity.

However, there is no guarantee that interference will not occur in a particular installation. If this device does cause harmful interference to other devices, which can be determined by turning the device off and on, the user is encouraged to try to correct the interference by one or more of the following measures: If this device does cause harmful interference to other devices, which can be determined by turning the device off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

Reorient or relocate the receiving device.

Increase the separation between the devices.

Connect the device to an outlet on a circuit different from that to which the other device(s) are connected.

Consult the manufacturer or field service technician for help.

- The device is Class A (CISPR11 classification). It is allowed in domestic establishments when used under jurisdiction of a health care professional.
- Never use the device with cables or accessories other than the designated ones. Malfunction caused by improper electromagnetic compatibility (EMC) characteristics may result.
- Never use portable or mobile radio frequency (RF) devices in the vicinity of this device.

These devices may adversely affect medical electrical equipment and malfunction may result.

After use

- CAUTION**
- **This device uses a heat-sensitive printer paper. To keep the printed data for a long period of time, make copies of the printouts.**

The paper degrades over time and the printed data may become illegible.

- **When the device is not in use, turn off the power switch and put the dust cover over the device.**

If not, dust may affect the measurement accuracy.

- **Do not yank the power cord to disconnect it from a wall outlet but hold the plug.**
This can damage the metal core of the cord and may result in fire, short circuit or electric shock.

- **Occasionally clean the prongs of the main plug with a dry cloth.**

If dust settles between the prongs, the dust will collect moisture, and short circuit or fire may occur.

- **If the device will not be used for a long time, disconnect the power cord from the wall outlet.**

Fire may occur.

- **Maintain the surrounding temperature and humidity in the following ranges during transport and storage of the device.**

Environmental conditions

Temperature: –10 to 55°C (14 to 131°F)

Humidity: 10 to 95% (non-condensing)

Atmospheric pressure: 700 to 1060 hPa

A place with low dust

A place not exposed to direct sunlight

- **When transporting, pack the main body in the original packing material with the fixing lever unlocked.**

Excessive vibration or impact may cause device malfunction.

Maintenance and check

- CAUTION**
- **Only service technicians properly trained by us can repair the device.**
We are not responsible for any accidents resulted from improper servicing.
 - **When performing maintenance work, secure sufficient maintenance space.**
Maintenance work in an insufficient space may result in injury.
 - **When the device is sent back for repair or maintenance, wipe the surfaces (especially, the area where patients contact) of the device with a clean cloth dampened with ethyl alcohol for disinfection.**
Contact us or your authorized distributor to check whether the device needs measurement accuracy calibration if the AR-measured results are substantially different from subjectively measured results.
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1. BEFORE USE

1.1 Outline of the Device

The device which objectively measures refractive errors of sphere, cylinder, and axis. Refraction is mainly performed as a reference for lens prescription to correct the visual acuity using glasses or contact lenses.

This device is a single unit with the main body mounted on a base. The base is provided with a chinrest on the patient side and an LCD panel, operating buttons, joystick, and printer to facilitate alignment and other operations.

The device offers the following features in addition to the above features:

- The device is provided with an auto tracking mechanism that achieves alignment in the up-and-down direction.
- An auto shot function is provided; measurements to be taken automatically when the device is best aligned and in focus.
- A motorized up-and-down chinrest allows the operator to easily adjust the height of the chinrest.
- Printer has a paper auto-cut feature.

1.2 Intended Use

The Auto Refractometer is a diagnostic device that is indicated for use in the automated measurement of refractive errors of the eye.

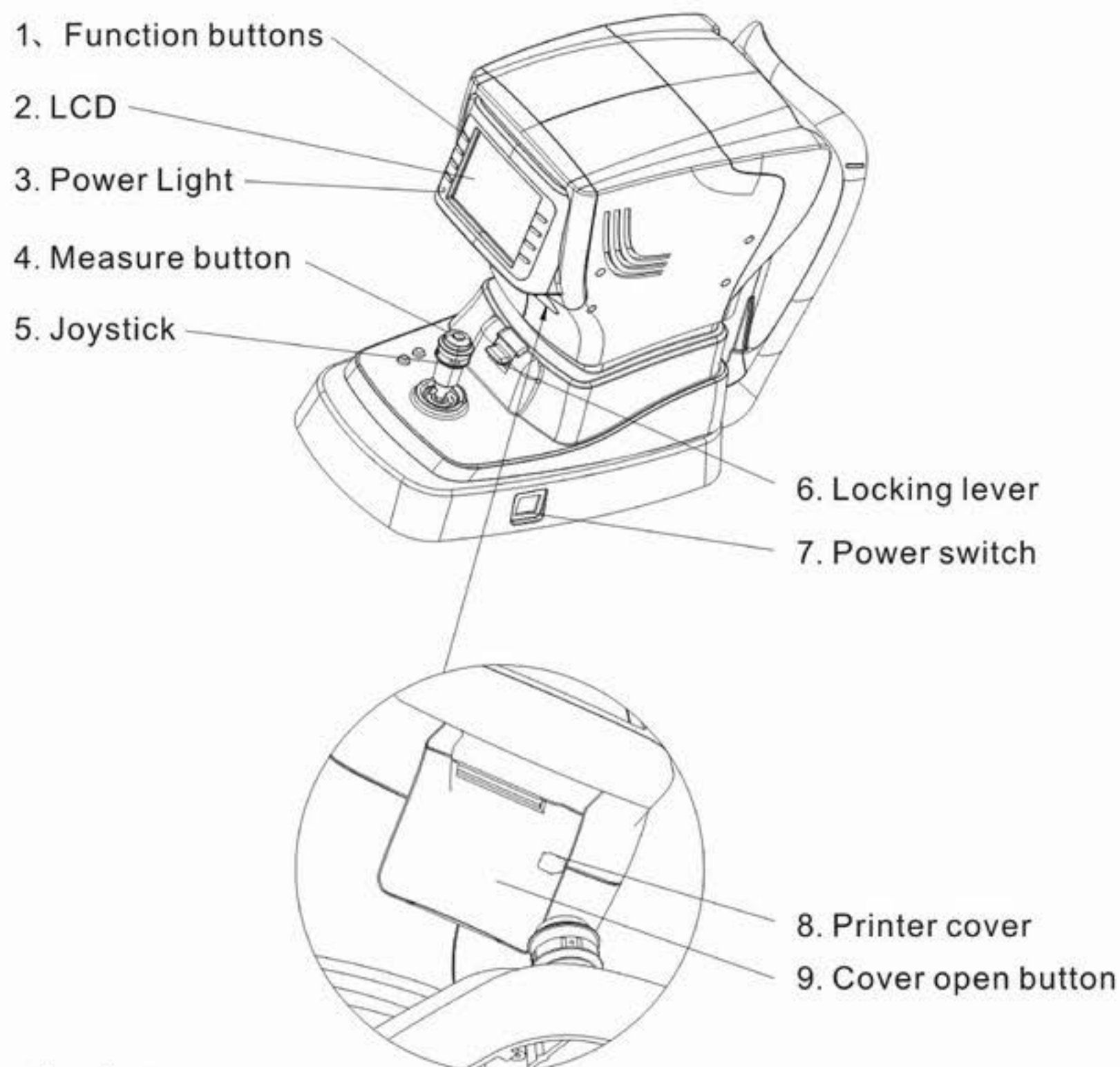
The Auto-Ref/Keratometer is a medical appliance which performs measurement of the refractive errors of the eye and corneal radius of curvature.

1.3 Principles

Fine measurement beams are projected on the fundus of the patient's eye by a projecting optical system and then computation is performed by capturing the reflected beams as a ring image to measure the refractive errors (SPH, CYL, and AXIS) of the patient's eye.

1.4 Configuration

Front view



1. Function buttons

Set the device and switch the screen.

Functions assigned to the function buttons are displayed by icons on the screen.

Two buttons in the lower left corner of the screen have unique functions when the measurement screen is displayed.

- Clear button ()

Erases measured data.

When the clear button is held for about a second, all the measured data is erased.

- Print button ()

Pressing this button can print out the measured data.

2. LCD

5.7-inch LCD. Pulling the bottom of the display panel provides an adjustable viewing angle.

For measurement in a standing posture, set the panel at a suitable angle. The panel is reset to its original position by magnet.

3. Power Light

The power light is on, indicating that the device powers on properly.

4. Measure button

When the measure button is pressed, measurement is taken regardless of the alignment or focusing condition of the device.

5. Joystick

Used for alignment and focusing.

Alignment in the right and left directions can be performed by moving the joystick to the right and left. Rotating the joystick is for alignment in the up and down directions. For focusing, move the joystick forward and backward.

6. Locking lever

Secures the main body to the base.

To lock the main body, press the locking lever down.

7. Power switch

Turns on the power to the device.

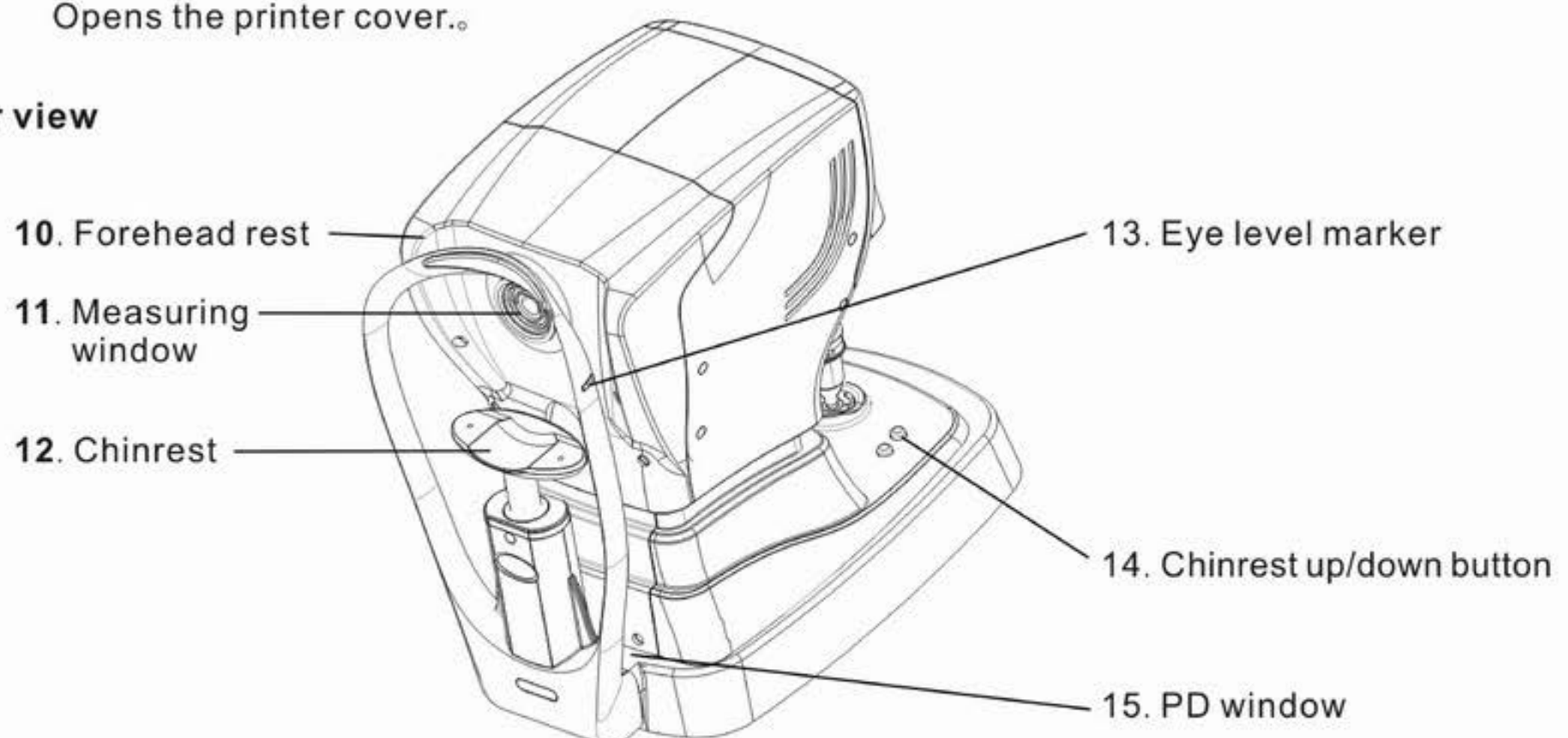
8. Printer cover

Protects a printer equipped with an auto cutter. Open the printer cover to replace printer paper by pressing the cover open button.

9. Cover open button

Opens the printer cover.

Rear view



10. Forehead rest

During measurement, the patient's forehead should be gently rest against the forehead rest. Clean the chinrest for each patient.

11. Measuring window

Check the window cleanliness before measurement.

12. Chinrest

Clean the chinrest for each patient.

13. Eye level marker

Used as a guide for the patient's eye level during measurement.

The height of the chinrest should be adjusted so that the center level of the patient's eye roughly aligns with this line.

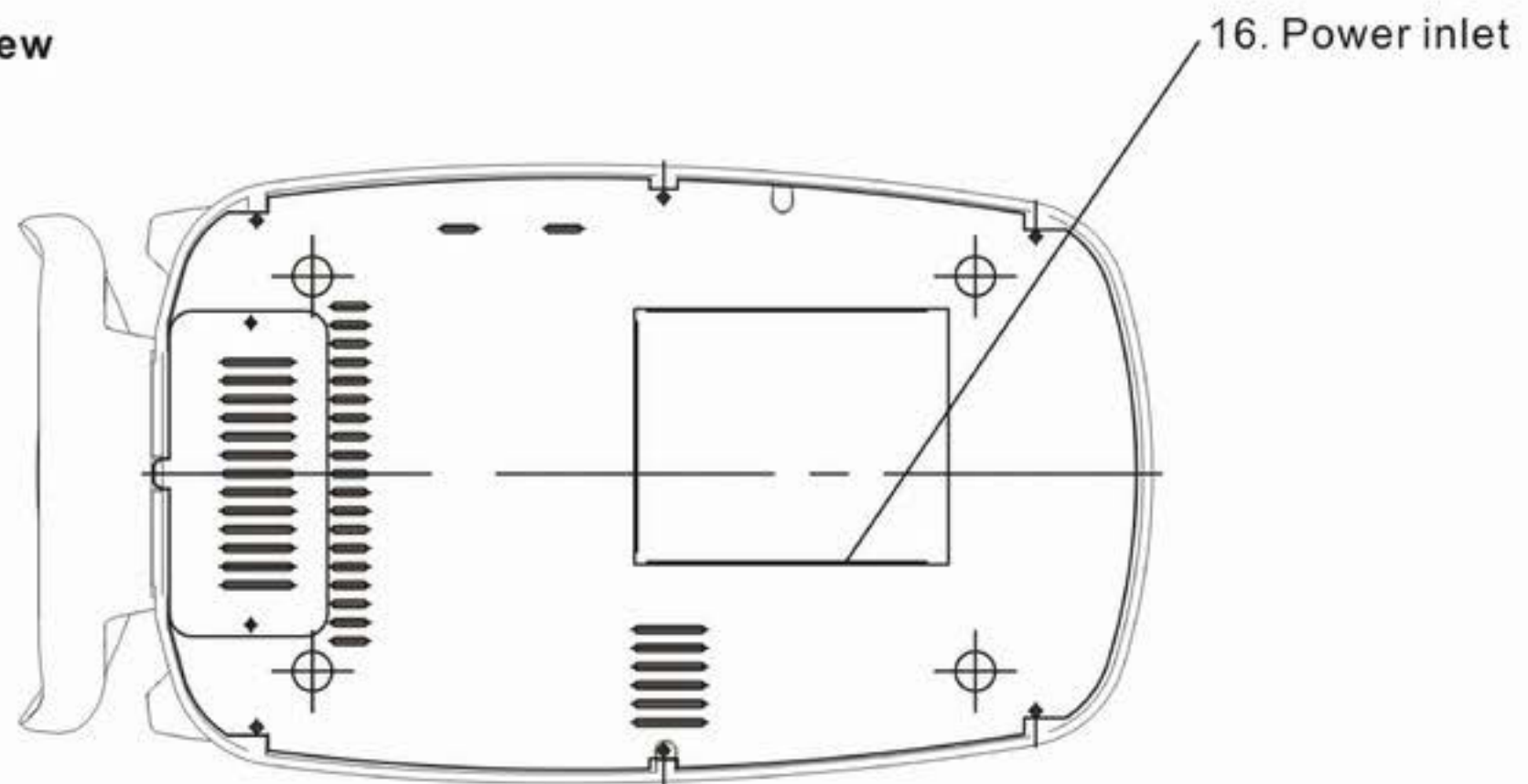
14. Chinrest up/down button

Moves the chinrest up or down.

15. PD window

An LED is provided to detect the PD value.

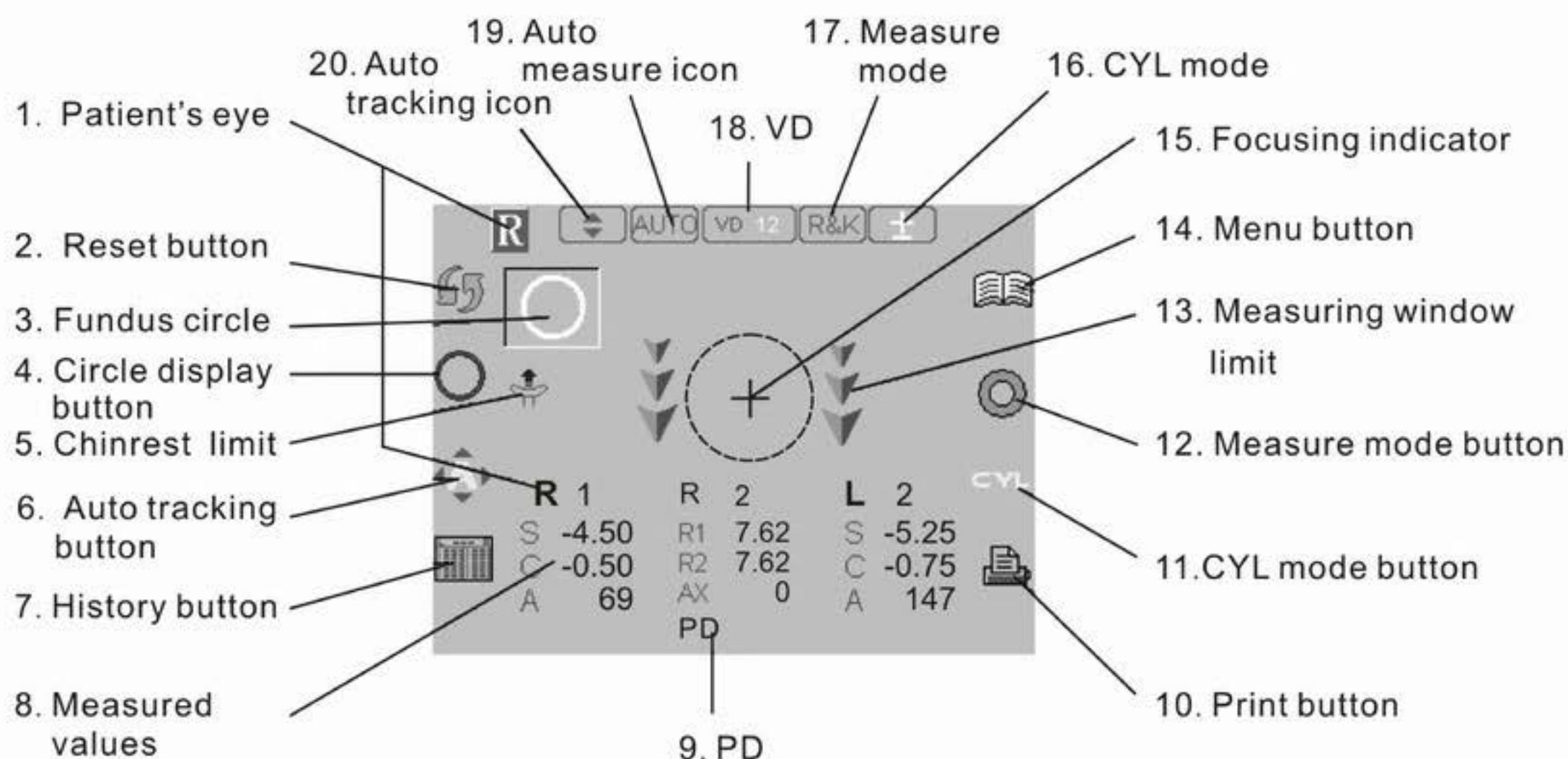
Underside view



16. Power inlet

A detachable power cord is connected here.

1.5 Measurement Screen Layout



1. Patient's eye

Indicates the right or left eye of the patient.

2. Reset button ()

Rest the device to initial state.

3. Fundus circle

After a measurement, you can observe the stored retina image by pressing the circle display key .If the image is an incomplete circle, the measurement is not reliable, and should be made once again. Incomplete retina images may be caused by eye blinking or by eye movement. Sometimes it is because the signal reflected from the retina is too weak, or the pupil diameter is less than 2.0mm, or the dust in the surface of the lens.

4. Circle display button

After pressing measurement key, a window will popup on the left upper LCD, Eyegroud parameter image cycle measured by instrument displays, which is used to judge the validity of measurement .Pressing the key again ,it will close the window.

5. Chinrest limit

When the chinrest is at the upper (or lower) mechanical limit, the upper limit indicator () or lower limit indicator () is displayed on the screen.

6. Auto tracking button

Selects the auto tracking function.

7. History button

Show the all measurements

8. Measured values

Displays the latest measured results.

9. PD

10. Print button

Print the measured results

11. CYL mode button

Switches cylinder mode.

CYL- Indicates cylindrical power by - reading.

CYL+ Indicates cylindrical power by + reading.

CYL± Cylinder data is indicated by + reading when the refractive error is positive for any axis angle. Indicates the cylindrical power by - reading in other cases.

Cylinder mode can be switched even after measurement.

Data is printed out with the mode status at the time of printing.

12. Measure mode button (KER Series)

Select the mode of REF , KER , R&K , SIZE.

13. Measuring window limit

When the measuring window at the upper (or lower) mechanical limit, the upper limit indicator () or lower limit indicator () is displayed on the screen.

14. Menu button

Set parameters, date and time, and enter comments.

15. Focusing indicator

Indicates the distance between the main body and the patient's eye.

Operate the joystick until the optimum condition is displayed.

16. CYL mode

Represents the selected cylinder mode.

17. Measure mode

Represents the selected cylinder mode.

18. VD

Represents the selected VD value.

19. Auto measure icon

Represents the setting of the auto measure function.

20. Auto tracking icon

Represents the setting of the auto tracking function (alignment in the up, down directions).

1.6 Checking Contents

Unpack the contents from the shipping carton and check them.

The following are included in the standard configuration.

- Main body
- Printer paper (2 rolls)
- Power cord
- Dust cover
- Operator's manual (this book)
- Model eye

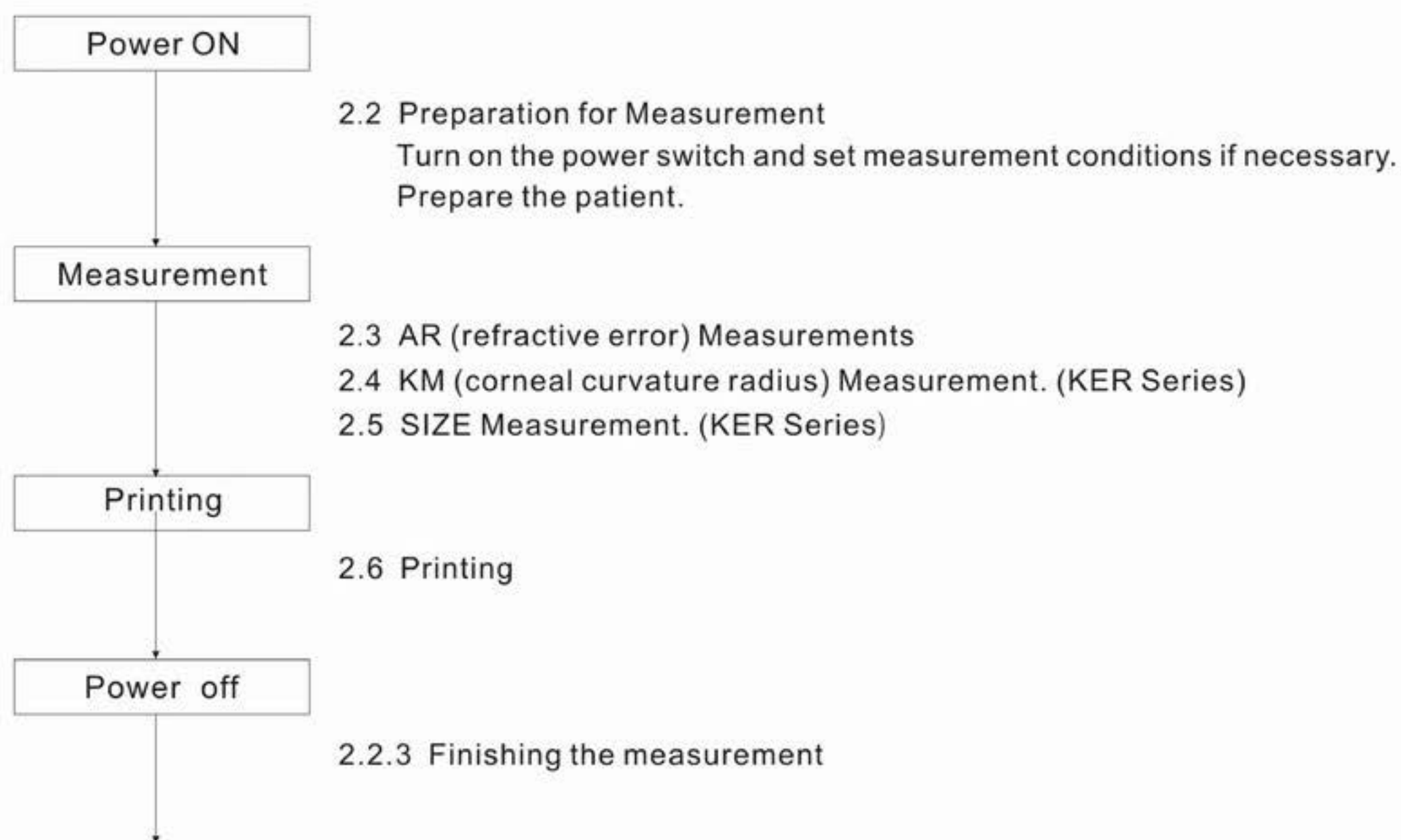
1.7 Before First Use

Place the device on a stable table and connect the power cord.

- 1 Place the main body to a stable table.
- 2 Lock the main body to the base unit with the locking lever and lay the device down gently.
- 3 Connect the power cord to the power inlet.
- 4 Stand the device upright.
- 5 Confirm that the power switch is turned OFF and plug the power cord into a wall outlet (Be sure to use an outlet equipped with a ground terminal, Electric shock or fire may occur in the event of device malfunction or power leakage).
- 6 Turn ON the power switch.
The initial screen is displayed on the LCD and the device starts initializing.
- 7 Confirm that the measurement screen is displayed.
- 8 Load the printer paper.

2. OPERATING PROCEDURES

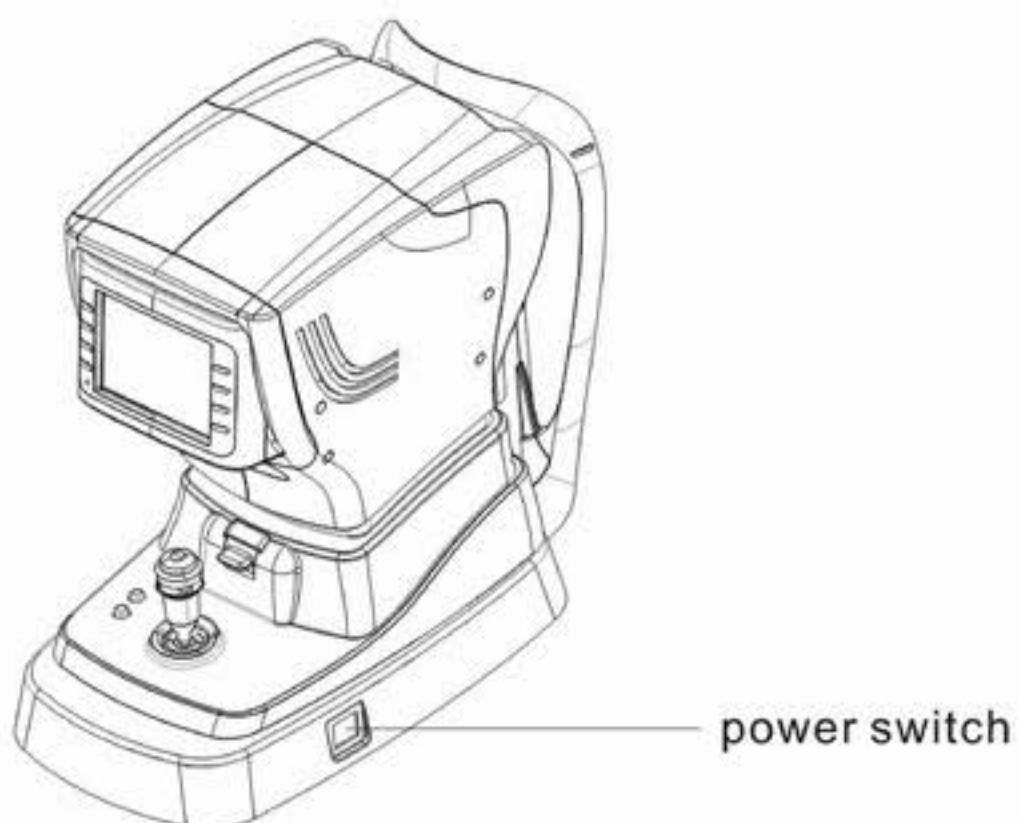
2.1 Operation Flow



* For lens prescription for correction of visual acuity of glasses or such, subjectively test the patient's visual acuity with reference to AR-measured data.

2.2 Preparation for Measurement

- 1 Turn on the power switch.



The initial screen is displayed and the device is initialized.



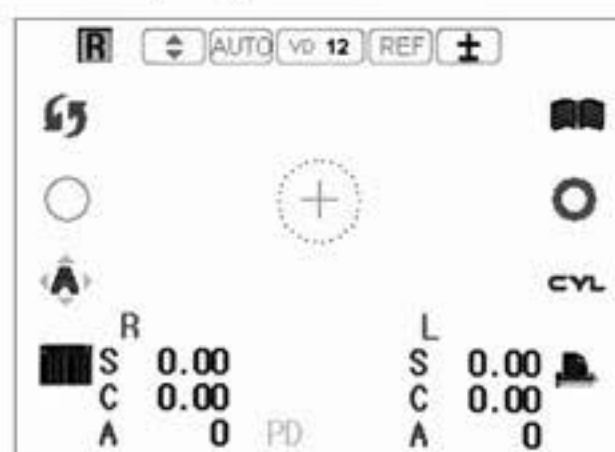
Initial screen (REF)



Initial screen (REF/KER)

Wait for a while until the screen is switched to the measurement screen. When the power to the device is turned on, the main body makes small right/left movements in order to determine the initial setting position for auto tracking. This does not mean that the device has been broken.

2 The measurement screen is displayed.



Measurement screen

3 Perform checks before use

Perform the following checks before use.

No error message is displayed.

The main body moves smoothly using the joystick.

The chinrest moves up and down by pressing the chinrest up/down button.

Printer supply is adequate.

The measurement accuracy satisfies the specifications.

4 Establish measurement conditions.

The following conditions should be specified:



No Focus



Focus

1: Measure mode

Press the auto tracking button to select auto tracking and select the auto measure on the menu.

Auto tracking	Auto measure	Screen display	Description
Up and Down	ON		Auto tracking in the up-and-down directions is turned on. Manually align the device in the left-and-right. Measurement starts automatically when the eye is best aligned and focused.
	OFF		Auto tracking in the up-and-down directions is turned on. Manually align the device in the left-and-right and bring the eye into focus. Press the measure button to start measurement.
OFF	ON		Manually align the device and bring the eye into focus. Measurement starts automatically when the eye is best aligned and focused.
	OFF		Manually align the device and bring the eye into focus. Press the measure button to start measurement.

2 : Measurement conditions set by parameters

Various device conditions can be set by parameters.

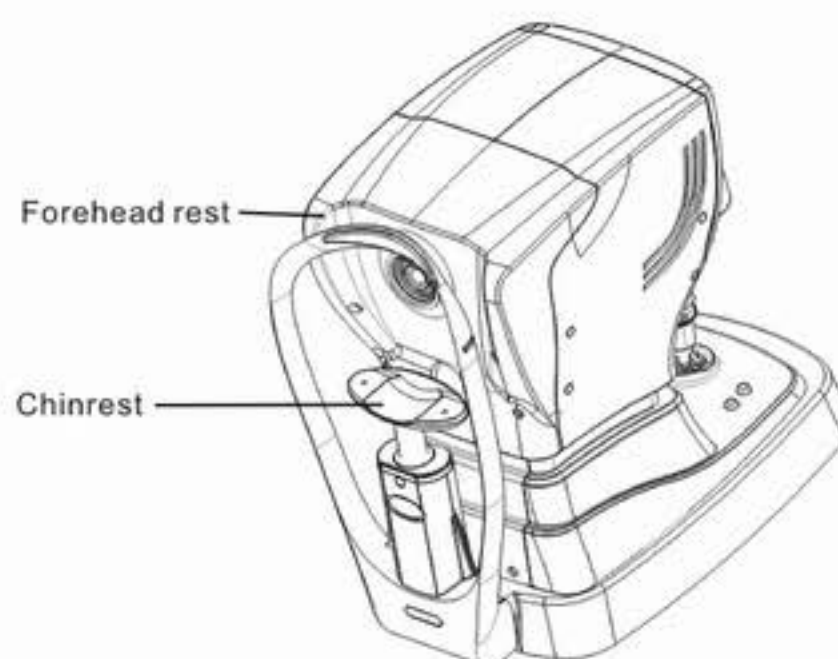
3: CYL mode

The cylinder mode, reading direction of cylinder data in which cylinder data (cylindrical power) is represented during measurement is selected by pressing the CYL mode button.

Screen display	CYL mode	Description
CYL-	- reading	Indicates cylindrical power by + reading.
CYL+	+ reading	Indicates cylindrical power by - reading.
CYL ±	Mix reading	Cylinder data is indicated by + reading when the refractive error is positive for any axis angle. Indicates the cylindrical power by - reading in other cases.

5 Prepare the patient.

- 1) Wipe the forehead rest and chinrest that contact the patient with clean absorbent cotton or gauze dampened with rubbing alcohol. If a stack of chinrest paper is fixed on the chinrest, remove one sheet of paper.
- 2) Instruct the patient to take off glasses or contact lenses and sit on a chair.



-
- 3) Have the patient place his/her chin on the chinrest as deeply as possible, and his/her forehead on the forehead rest lightly.
 - 4) Adjust the height of the chinrest by pressing the chinrest up/down button until the center level of the patient's eye aligns with the eye level marker. Before adjusting the height of the chinrest, let the patient know that the chinrest moves up and down.

When the chinrest is at the upper (or lower) mechanical limit, the upper limit indicator (or lower limit indicator) is displayed on the screen.

6 Start measurement.

See "2.3 AR (refractive error) Measurements" for details of measurements.

Instruct the patient not to blink during measurement. Additionally, instruct the patient not to blink or open his/her eyes immediately before measurement to avoid measurement failure. Instruct the patient to keep both eyes wide open during measurement. Closing one eye may cause an unstable fixation and the other eye may not open wide.

7 Print the measured results.

Printing operation varies according to the parameter setting.

2.2.1 Sleep mode

The device goes into sleep mode automatically to save power if no operation is performed for a certain period of time. The time that the device goes into sleep mode can be selected from 5 minutes, 15 minutes, or NO (no sleep mode) (factory setting: 5 minutes).

Sleep mode places the device into the following conditions:

- The LCD goes off.
The working status LED blinks.
- LCD has been in screen protection always
The working status LED blinks.

The device recovers to normal mode from sleep mode by the following methods:

- Press any button.
- Manipulate the joystick to move the base R or L.

2.2.2 Finishing the measurement

- 1 To finish the measurement, turn off the power switch. It is allowed to turn off the power with any screen displayed.
 - 2 Check the measuring window and clean the lens if necessary.
 - 3 Clean the forehead rest and chinrest, and put the supplied dust cover on the device.
Always keep them clean for the next use.
-

2.3 AR (refractive error) Measurements

1 Instruct the patient to: “Look through the measuring window. As you will see the picture, watch the center of it without straining”.

2 Manipulate the joystick to display the patient’s eye on the screen.

By moving the joystick laterally, the main body moves right, left, forward and backward.

By turning the upper part of the joystick, the main body moves up and down. Align the eye position to the measuring point with right, left, up and down movements. Adjust the focus with forward and backward movements.

3 Perform alignment and focusing

The methods of alignment and focusing vary according to the settings of the auto tracking and auto shot.

Up-and-down auto tracking

1) Perform rough alignment and focusing by manipulating the joystick to place in the working range of auto tracking.

2) When the device is placed within the working range of auto tracking, it automatically starts alignment in the up-and-down direction.

3) Manipulate the joystick to move the mire ring reflected on the patient’s eye within the target.

Auto tracking OFF

1) Manipulate the joystick to perform rough alignment and focusing.

2) As the focusing indicator is displayed, manipulate the joystick until the optimum focusing indicator is displayed. During the focusing, maintain alignment between the device and the patient’s eye.

When main body is not within the working range of auto tracking:

As the limit indicator is displayed, manipulate the joystick or chinrest up/down button in the direction of the arrows.

	Move the chinrest up.
	Move the chinrest down.

4 Measurement starts.

Measurements are taken automatically when the device is best aligned and focused on the eye (when the auto measure function is turned on).

When the auto measure function is turned off, press the start button to start measurement

5 Measurement completes.

When the specified number of AR measurements is performed and the data is stable (no .

variations)the measurement automatically completes.

6 Measure the other eye in the same manner.

When the eye to be measured is switched, the measuring unit returns to the origin in the forward-and-backward and side-to-side directions.

7 Let the patient know that the measurement is completed and instruct him or her to rest comfortably.

8 Print the measured results.

2.4 KM (corneal curvature radius) Measurement. (KER Series)

Preferences: mm, D, AVG.

Mm: the horizontal and vertical corneal radius

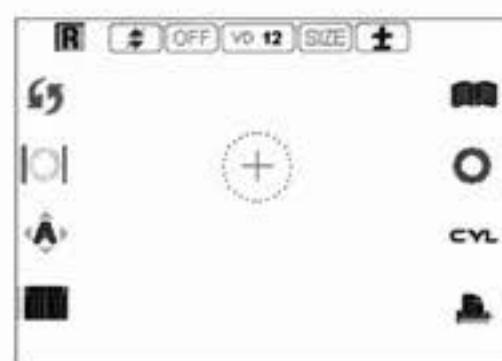
D: the horizontal and vertical corneal diopter

AVG: the average of corneal radius

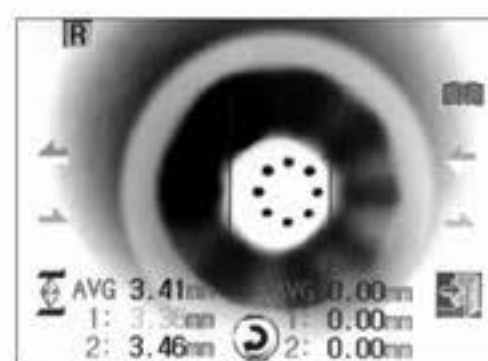
1. For the Keratometer measurement mode1, please refer to the same procedures of 2.3
2. For the Ref&Keratomer measurement mode, please refer to the same procedures of 2.3

2.5 SIZE Measurement. (KER Series)

Press“  ”button to select Size main interface .Press“  ”button to enter corneal radius measurement interface, please to the lower right diagram.



SIZE main
measurement interface



Corneal radius
measurement interface

2.6 Printing

2.6.1 Printing measured data

Measured data is printed out by pressing the print button after measurement.

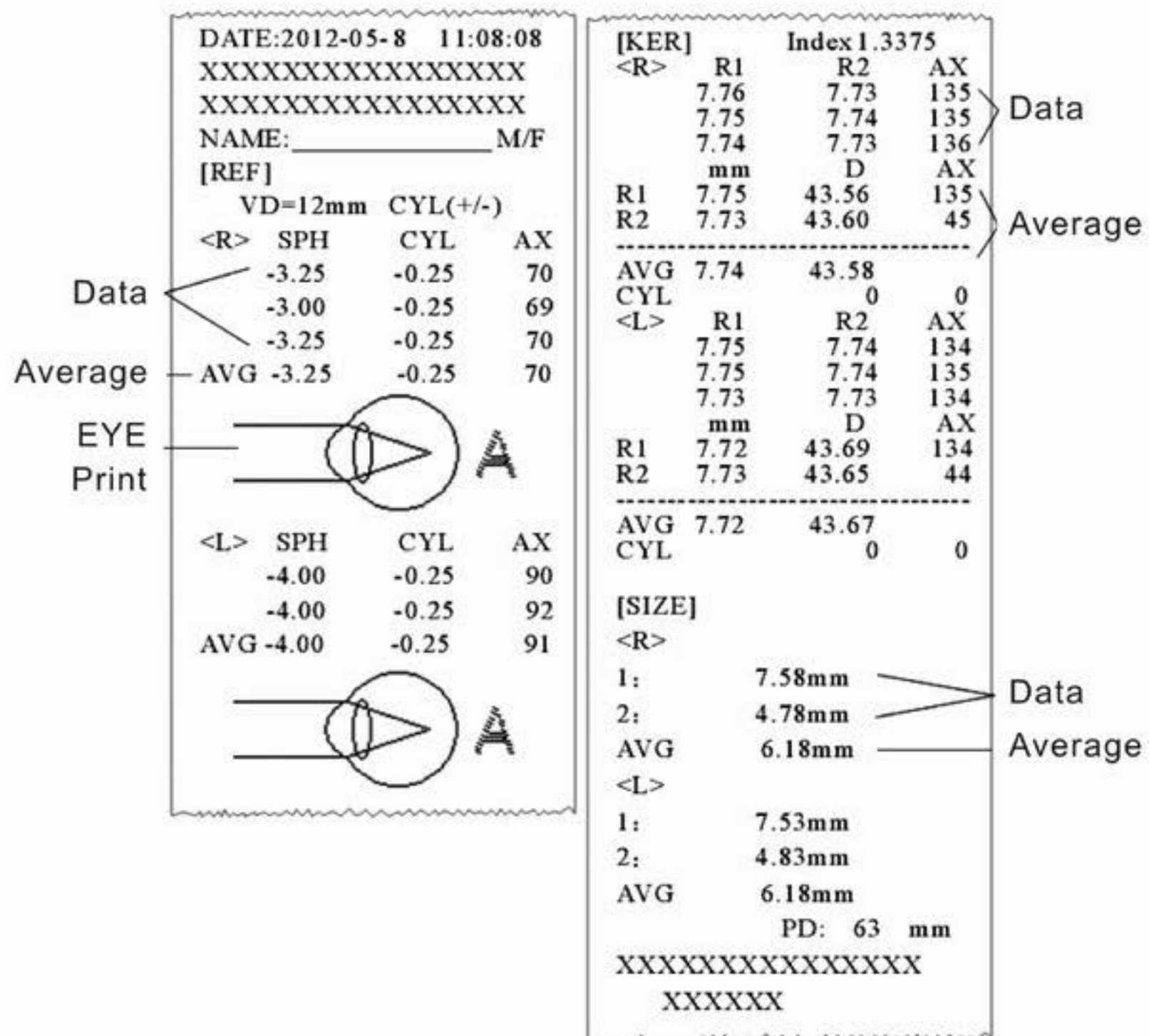
(Sample printout)

	DATE:2012-05-8 11:08:08	Date and time
Company	XXXXXXXXXXXXXXXXXXXX	
Add	XXXXXXXXXXXXXXXXXXXX	
Name	NAME: _____ M/F	
VD	VD=12mm	
Right	R S C A	
Sphere	-3.25 -0.25 70	Results of Right-eye (last 3 results is printed)
Cylinder	-3.00 -0.25 69	
	-3.25 -0.25 70	
	→ -3.25 -0.25 70	Average
Left	L S C A	
	-4.00 -0.25 90	Results of Left-eye (last 3 results is printed)
	-4.00 -0.25 92	
Axis	-3.75 -0.50 91	
	→ -4.00 -0.25 91	Average
Pupil distance	PD: 63 mm	
Manufacturer	XXXXXXXXXXXXXXXXXXXX	
Model	XXXXXX	

VD: vertex distance from lens to cornea.

PD: Distance between two pupils

Continuous to the left diagram



2.6.2 Printing parameter settings

The settings of the printing parameter's options are as follow:

Printer	OFF、ON
REF print	STD、ALL、AVG、OFF
KER print	STD、ALL、AVG、OFF
EYE print	OFF、ON
Print&Clear	Clear、Reserve

2.6.3 Replacing Printer Paper

When the paper is running short, please stop using the printer and replace printer paper with new one.

Note : Do not run the printer when printer paper is not loaded. It may ruin the printer head.

Do not pull the paper in the printer forcefully. This may cause malfunction of the printer.

1. Press the cover open button to open the printer cover.



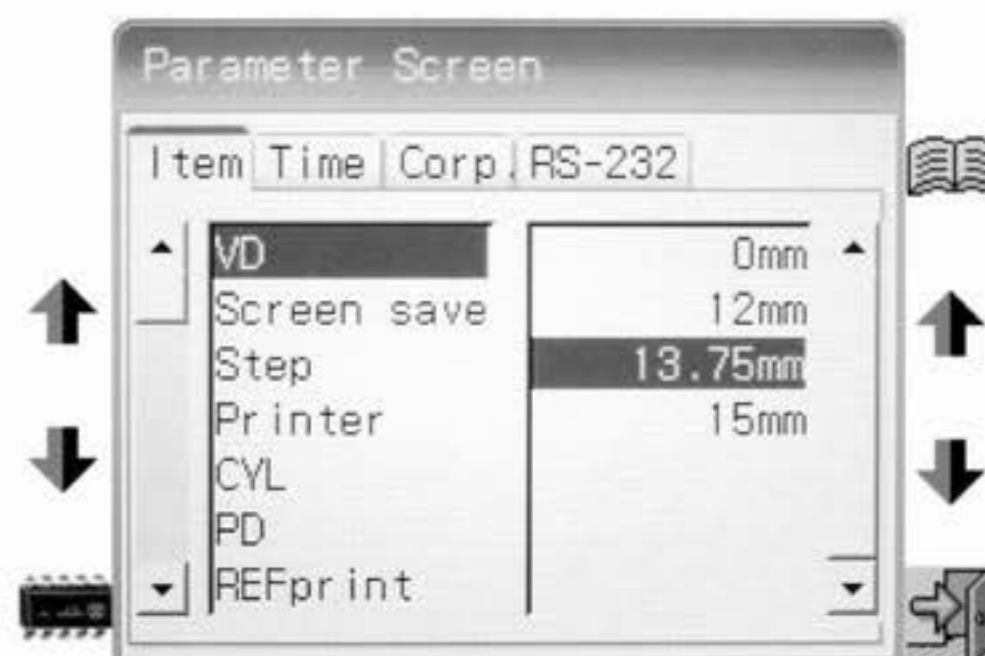
2. Insert new printer paper.
Load printer paper as shown in the picture on the right. Set printer paper so that its end is exposed from the cover.



3. Push the printer cover toward the main body.



2.7 Parameter Settings



2.8 Main Parameters Settings

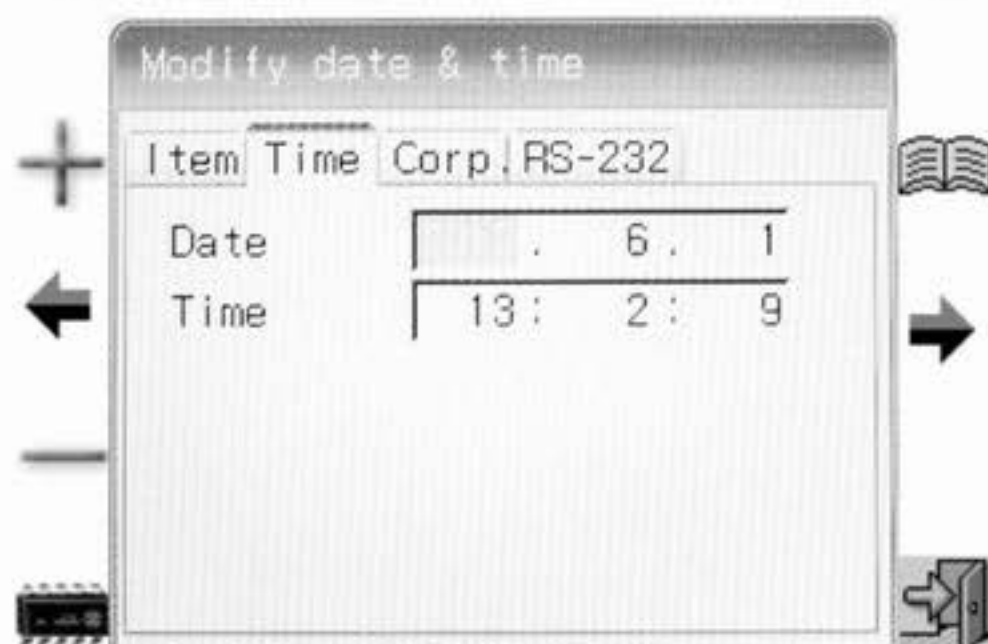
Title	Option
VD	0mm , 12mm , 13.75mm , 15mm
Screen saver	Disabled,5min -> OFF,5min -> ON,15min ->OFF, 15min -> ON
Step	0.12D , 0.25D
Printer	OFF , ON
CYL	+/-,+,-
PD	OFF, ON
REF Print	STD ,ALL ,AVG ,OFF
M.Speed	HIGH , MID ,LOW
M.Mode	REF , KER , R&K ,SIZE
K.Index	1.3375 , 1.336 , 1.332
KER Print	STD ,ALL ,AVG ,OFF
EYE Print	OFF , ON
KER INC	mm , D ,AVG
R&K Disp	Left , Mid
M.Auto	OFF , Auto
Print&Clear	Clear, Reserve
Astigmatism	+ , -
AUTO lift	OFF , Auto
Brightness	1 , 2 , 3 , 4 ,5

Note : Options in bold font style are factory defaults.

Choose the parameter you need according to the arrow direction, then press  or  the parameters can be saved. Other keys don't work.

2.9 Setting the date and time

Press  to enter the interface of time setting, setting the date and time..



Move the  or  arrow to the item and pressor  to  adjust the data, press  or  to save data.

3. SPECIFICATIONS AND ACCESSORIES

2.10 Setting the company

Press  to enter the interface of company setting, setting the company



shift  : Company/address

Entry Left-click  : Current entry moves towards left by one character.

Entry Right-click  : Current entry moves towards right by one character.

Characters Left-click  : Characters box moves to left by one.

Characters right-click  : Characters box moves right by one

Line Feed  : Cursor in characters box moves down by one line.

Save  : Save the settings data.

Exit  : Save data and exit to the measurement interface.

3.1 Specifications

Measurement of refractive error (AR measurement)

Spherical power (S) -20.00 to +20.00D (VD=12mm)
0.12/0.25D increments

Cylindrical power (C) 0 to ± 10 D
0.12/0.25D increments

Cylinder axis (A) 0° to 180°
1° increments

Vertex distance (VD) 0, 12, 13.75, 15mm

Minimum pupil diameter measurable ϕ 2mm

Chart Auto fogging system

Accuracy The accuracy specifications are based on the results of eye model testing performed in accordance with ISO10342, Ophthalmic Instruments - Eye Refractometers.

Item	Measurement range	Step	Tolerance
Spherical (S)	-20.00 ~ +20.00D	0.12/0.25D	0 ~ ± 10.00D: ± 0.25D
			± 10.00 ~ ± 20.00D: ± 0.50D
Cylindrical (C)	-10.00 ~ +10.00D	0.12/0.25D	± 0.25D
Axis (AX)	0 ~ 180°	1°	3°

KM (corneal curvature radius) Measurement.(KER Series)

Ker. index (K.index)	1.3375,1.336,1.332
Radius of Curvature	5.0 to 10.00mm 0.01mm increments
Corneal Power	33.00 to 67.5D 0.12/0.25D increments
Corneal Diameter	2.00 to 14.00mm 0.01mm increments

PD measurement

Measurement range	40 to 85 mm 1.00mm increments
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Movable range of horizontal direction (by joystick)

Forward and backward	36 mm
Right and left	85 mm

Working range of auto tracking

Up and down	±16mm
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Other functions

Auto shot	Measurement starts automatically when the device is best aligned and focused.
Display	5.7-inch color LCD
Printer	Thermal line printer with auto cutter Width 58 mm

Dimensions and weight

Dimensions	480 (L) × 270(W) × 445(H)mm
Weight	17kg
Power source	AC100~AC240V±10%50/60Hz
Power consumption	100VA

Environmental conditions (during use)

Temperature	10 to 35°C (50 to 95°F)
Humidity	30 to 90%
Pressure Atmospheric pressure	800 to 1060 hPa

3.2 Standard accessories

Main body	1 unit
Printer paper	2 rolls
Power cord	1 unit
Dusts cover	1 unit
Operator's manual	1 volume